

REMARKS

Claims 1, 6-14, 16 and 18-23 are pending. By this Amendment, claims 1, 6-10, 12, 14 and 16 have been amended, claims 2-5, 15 and 17 have been cancelled and claims 18-23 have been added.

Independent claims 1, 6, 7, 9, 12, 14 and 16 have been amended as follows:

Claim 1 includes the features of original claims 1, 3 and 4,

Claim 6 includes the features of original claims 1, 3, 5 and 6,

Claim 7 includes the features of original claims 1, 3 and 7,

Claim 9 includes the features of original claims 1, 3 and 9,

Claim 12 includes the features of original claims 1, 3 and 12,

Claim 14 includes the features of original claims 1, 3 and 14, and

Claim 16 includes the features of original claims 1, 3 and 16. Claim 16 has also been clarified.

Support for the features in new claims 18-23 can be found, at least, as follows:

Claim 18 - Fig. 7 and page 24, line 20 - page 28, line 21,

Claim 19 - Fig. 7 and page 25, lines 10-21,

Claim 20 - Fig. 7 and page 28, lines 5-7 and page 29, line 16 - page 31,
line 24,

Claim 21 - Fig. 7 and page 29, lines 8-13 and page 32, lines 6-11,

Claim 22 - Fig. 7 and page 31, lines 17-20 and page 31, line 25 - page 32,
line 3, and

Claim 23 - original claim 15.

Claims 1-3, 5, 8 and 14-17 were rejected under 35 U.S.C. §102(b) over Wright et al. (Wright), U.S. Patent No. 5,873,335 and claim 4 was rejected under 35 U.S.C. §103(a) over

Wright in view of Shiraishi et al. (Shiraishi), U.S. Patent No. 6,371,065. The rejections are respectfully traversed.

Wright and Shiraishi fail to disclose or suggest a valve-driving system, wherein a motor control device sets a control amount of an electric motor while taking, into account, a variation of friction torque which acts on a rotation of a cam, as recited in amended claim 1.

As admitted on page 6 of the Office Action, Wright fails to disclose all of the features of original claim 4 (which has been incorporated into claim 1).

Shiraishi fails to overcome the deficiencies of Wright. Shiraishi discloses an internal combustion engine 1 that is equipped with variable valve mechanisms 30 and 40 that drive valves 10 and 11 by controlling the electric current to the coils 30a, 30b, 40a and 40b (col. 2, lines 53-60). Shiraishi fails to provide any disclosure with regard to controlling the electric current to the coils 30a, 30b, 40a, and 40b in accordance with a variation of friction torque that acts on a rotation of a cam.

When the motor vehicle stops and the engine is rotating (i.e., idling), the engine generates a slight amount of engine torque so that the engine may rotate against friction loss and other mechanical losses (Fig. 6 and col. 5, lines 17-20). Accordingly, when Shiraishi refers to friction loss, Shiraishi refers to friction loss that corresponds to a resistance to the rotation of the engine itself. This friction loss is not the same as the friction torque of claim 1. In claim 1, the friction torque is a torque that acts on the rotation of the cam that drives the valve. Furthermore, the motor to be subjected to the control carried out by taking the variation of the friction torque into account is a motor that serves as a drive source for rotating the cam.

In view of the foregoing, Wright and Shiraishi fail to disclose or suggest all of the features recited in claim 1.

Wright fails to disclose a valve-driving system, wherein a motor control device includes a valve rotation executing device which drives an electric motor such that a valve rotates around an axial direction thereof in a predetermined time period during stoppage of an internal combustion engine, as recited in claim 14.

By using the combination of features recited in claim 14, it is possible to scrape off carbon adhered to the valve or the valve seat by the rotation of the valve (Applicants' Fig. 22). It is also possible to move a contact position of the valve with a driving member (such as a rocker arm) around the axis of the valve to prevent deviated wear of the valve (Applicants' Fig. 23).

Wright discloses a system that drives a valve 12 reciprocally in an axial direction of a valve stem 28 by rotating a cam 40 and converting a rotation of the cam 40 into a linear motion using a cam follower 42 (Fig. 5). It is thus not possible for the valve 12 to rotate about its axis using the motor 18 during the stoppage of the engine. Furthermore, Wright is silent with regard to rotating the valve 12.

Accordingly, Wright fails to disclose all of the features recited in claim 14.

Wright also fails to disclose a valve-driving system, wherein a motor control device includes a mode switching device which switches driving modes of an electric motor between a normal rotation mode in which the electric motor is driven only in a normal direction to open and close the valve and a normal-reverse rotation mode in which the electric motor is normally or reversely rotated in accordance with an operation state of an internal combustion engine, as recited in claim 16.

Wright discloses a valve 12 that is driven by rotating a cam 15 or 40 only in a normal and reverse rotation mode (Figs. 1 and 5 and col. 4, lines 6-13 and lines 22-26, and col. 5, lines 18-21). However, Wright is silent as to an operation that switches the driving mode of the motor 18 between a normal rotation mode and a normal-reverse rotation mode.

Accordingly, Wright fails to disclose all of the features recited in claim 16.

In view of the foregoing, Wright and Shiraishi fail to disclose or suggest all of the features recited in claim 1, as well as the additional features recited in the dependent claims thereof, and Wright fails to disclose all of the features recited in claims 14 and 16. It is respectfully requested that the rejections be withdrawn.

The rejection of claims 1, 2 and 17 under 35 U.S.C. §102(b) over Blish, U.S. Patent No. 5,016,583 has been rendered moot by the cancellation of claim 17 and because 1 includes the features recited in original claims 3 and 4.

Claim 6 was rejected under 35 U.S.C. §103(a) over Wright in view of Miyashita et al. (Miyashita), U.S. Patent No. 5,220,904. The rejection is respectfully traversed.

Wright and Miyashita fail to disclose or suggest a valve-driving system, wherein a motor control device sets a control amount of an electric motor while taking, into account, a control state concerning intake or exhaust characteristics of an internal combustion engine and corrects the control amount of the motor such that an air fuel ratio is controlled to a predetermined target value while taking, into account, a control state concerning the air fuel ratio as a characteristic of the internal combustion engine, as recited in claim 6.

As admitted on page 7 of the Office Action, Wright fails to disclose all of the features recited in original claim 6.

Miyashita fails to overcome the deficiencies of Wright. In Miyashita, the air-fuel ratio control device (that detects an air-fuel ratio of the mixture and the operating conditions of the engine) calculates a desired air-fuel ratio based on detected operating conditions, and calculates an air-fuel ratio correction value applied for feedback-controlling the actual air-fuel ratio to the calculated desired air-fuel ratio (Abstract). However, Miyashita fails to disclose or suggest the concept of correcting the control amount of a motor, which drives a cam for opening and closing the valve, in accordance with the control state concerning the air-fuel

ratio of the engine to thereby control the air-fuel ratio to a target value. In other words, Miyashita is silent with regard to correcting the control amount of the motor for driving the valve to control the air-fuel ratio in accordance with an operating state of the engine.

Accordingly, Wright and Miyashita fail to disclose or suggest all of the features recited in claim 6. It is respectfully requested that the rejection be withdrawn.

Claim 7 was rejected under 35 U.S.C. 103(a) over Wright in view Hori et al. (Hori), U.S. Patent No. 6,401,684. The rejection is respectfully traversed.

Wright and Hori fail to disclose or suggest a valve-driving system with an abnormality judging device which judges whether the valve-driving system is abnormal based on a correction amount with respect to a control amount of an electric motor, the correction amount being provided by a consideration of a control state concerning intake or exhaust characteristics of an internal combustion engine, as recited in claim 7.

As admitted on page 7 of the Office Action, Wright fails to disclose all of the features recited in claim 7.

Hori fails to overcome the deficiencies of Wright. Hori discloses an apparatus that judges an abnormality of a valve system based on (1) a variation of the pressure of the intake or exhaust gas (col. 14, lines 42-50 and Fig. 20), (2) a variation in the quantity of the intake air (col. 15, line 61 - col. 16, line 3 and Fig. 21), or (3) the initialization times required for an initializing operation which is executed at a time when the valve-driving system goes from the abnormal condition to the normal condition (col. 17, line 38 - col. 18, line 24 and Fig. 22). Hori is silent as to the concept of judging an abnormality of a valve system based on a correction amount with respect to the control amount of the electric motor that drives the cam for the valve, as recited in claim 7.

Accordingly, Wright and Hori fail to disclose or suggest all of the features recited in claim 7. It is respectfully requested that the rejection be withdrawn.

Claim 9 was rejected under 35 U.S.C. §103(a) over Wright in view of Gu et al. (Gu), U.S. Patent No. 6,663,524. The rejection is respectfully traversed.

Wright and Gu fail to disclose or suggest a valve-driving system, wherein when a friction torque acting on a rotation of a cam assumes a negative value, an electric motor is capable of being driven by a rotation motion of the cam to generate electricity, as recited in claim 9.

As admitted on page 8 of the Office Action, Wright fails to disclose all of the features recited in original claim 9.

Gu fails to overcome the deficiencies of Wright. Gu discloses an apparatus in which a power unit (internal combustion engine) 10 and an electric motor 50 are provided as driving sources of a vehicle and the motor 50 is used to generate electricity in combination with the starting of the power unit 10 when stored electricity runs low (col. 6, lines 27-40). In other words, Gu merely discloses the generation of electricity using surplus power from the internal combustion engine 10 in a system having both an engine and an electrical motor as power sources.

In the process of driving a cam, the friction torque acting on a rotation of the cam can assume a negative value (see Applicants' Fig. 13, for example). In such a case, the motor is allowed to generate electricity using the rotation of the cam. Gu fails to disclose or suggest this feature.

In view of the foregoing, Wright and Gu fail to disclose or suggest all of the features recited in claim 9. It is respectfully requested that the rejection be withdrawn.

Claims 10 and 11 were rejected under 35 U.S.C. §103(a) over Wright in view of Schroeder et al. (Schroeder), U.S. Patent No. 5,494,007. The rejection is respectfully traversed.

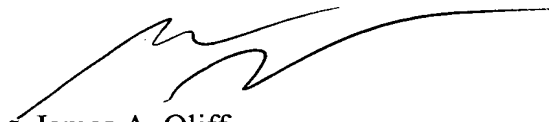
Schroeder fails to overcome the deficiencies of Wright and Shiraishi in disclosing the motor control device as recited in claim 1. Accordingly, none of the applied references disclose or suggest all of the features recited in claim 1 as well as the additional features recited in claims 10 and 11. It is respectfully requested that the rejection be withdrawn.

Applicants appreciate the indication of allowable subject matter in claims 12 and 13.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1, 6-14, 16 and 18-23 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachments:

Petition for Extension of Time
Amendment Transmittal

Date: September 12, 2005

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